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## **DETAILED DESCRIPTION**

#### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention carries out digital coding compression of the variety of information, and the memory card having the nonvolatile semiconductor which recorded the digital data by which coding compression was carried out is used, The digital data playback equipment which reproduces the digital data recorded on the memory card of said nonvolatile semiconductor is started, and when reproducing the information which advances to the time series currently recorded especially, it is related with the digital data playback equipment in which fast forwarding reproduction is possible to a forward direction or an opposite direction.

[0002]

[Description of the Prior Art] Increase of the storage capacity of a non volatile semiconductor memory is achieved in recent years, and a lot of data is becoming recordable. This non volatile semiconductor memory is card-sized, it uses as a recording medium which replaces the magnetic tape which records a silver halide film and a sound, and development utilization of the digital still camera and voice recording apparatus which record a still picture is carried out.

[0003]Said digital still camera and voice recording apparatus change into a digital signal the analog signal incorporated and generated with a photographing camera, a microphone, etc., carry out coding compression of this digital signal, change it into the data of predetermined data format composition, and are recorded on said non volatile semiconductor memory.

[0004]Said non volatile semiconductor memory divides data storage area into two or more physical blocks for every predetermined data volume, and can manage record or elimination of data now for said every physical block. In order that said non volatile semiconductor memory may enable reading and edit of record data with computer apparatus, the data format generally based on MS-DOS which is OS of computer apparatus is adopted.

[0005]Change into the data format of said MS-DOS said record data by which coding

compression was carried out by a microprocessor, and the managed file data of record data is created, It records on the physical block of said non volatile semiconductor memory, and read-out and elimination of record data which are recorded on two or more physical blocks are performed using said file management data.

[0006]The example of the digital data recording and reproducing device using said non volatile semiconductor memory is explained using drawing 5. Drawing 5 is a block diagram showing the composition of the digital data recording and reproducing device for sounds.

[0007]The voice input circuit 21 of the digital data recording and reproducing device 20 for sounds shown in drawing 5 comprises an amplifying circuit which amplifies the analog voice signal generated with the microphone which collects sounds, such as music and people's voice, and generates the electrical signal of an analog, and the microphone. The analog voice signal generated in this voice input circuit 21 is changed into a digital sound signal in the analog-to-digital conversion circuit (henceforth an A/D circuit) 22, and is supplied to the coding compression circuit 23. This coding compression circuit 23 is \*\*\*\*\* so that said digital sound signal may be coded, a data compression may be performed and predetermined digital compressed data may be generated. The compression technology of G729A of the ITU (International Telecommunications Union) standard is used for the coding compression in this coding compression circuit 23.

[0008]The digital coding compression data generated in this coding compression circuit 22 is recorded on the card (henceforth a nonvolatile memory card) 25 which carries a non volatile semiconductor memory via the microprocessor 24. Said digital coding compression data writes this microprocessor 24 in said nonvolatile memory card 25, it performs reading control, and it also generates the management data of said write-in digital coding compression data.

[0009]The digital coding compression data read from said nonvolatile memory card 25 by the basis of control of this microprocessor 24 carries out data extension, decrypts in the decryption extension circuit 26, and is changed into a digital sound signal.

[0010]The audio signal from which the digital sound signal generated in this decryption extension circuit 26 was changed into the analog voice signal in the digital/analog conversion circuit (henceforth a D/A circuit) 27 is supplied to an amplifying circuit and the voice response circuit 28 which comprises a loudspeaker.

[0011]The operation switch 29 with the switch for operation of voice recording, sound reproduction or operation power OFF of this digital data recording and reproducing device 20, etc., etc. in said microprocessor 24, According to the input from this operation switch 29, the liquid crystal display means 30 which shows the operating state of the digital data recording and reproducing device 20 is connected.

[0012]An MS-DOS format is used so that the recorded data can also use computer apparatus, and said nonvolatile memory card 25 is removable to the card slot provided in the case which

is not illustrating the digital data recording and reproducing device 20.

[0013]Said A/D circuit 22, the coding compression circuit 23, the decryption extension circuit 26, and the D/A circuit 27 comprise the speech processing integrated device (henceforth speech processing IC) 31 of one chip.

[0014]With such a digital data recording and reproducing device 20 of composition, when recording data on said nonvolatile memory card 25, Based on said MS-DOS format, generation record of the management data of a directory entry or FAT (File Allocation Table) is carried out in management of a data file and a recording block. the file data reading appearance of the request [ time of reproduction ] by the basis of said management data -- it is carrying out. While reproducing digital coding compression data based on the data recorded in this MS-DOS format, The fast forward mode which reproduces previous data rather than the data reproduced now, Or when special reproduction modes, such as a review mode which returns to reproduced data already, are chosen with said operation switch 29, said microprocessor 24 needs to search the recording block of a rapid traverse and a review place based on the management data currently recorded on said nonvolatile memory card 25.

[0015]On the other hand, the management data currently recorded on said nonvolatile memory card 24, Since the recording order data of the recording block of the recorded predetermined digital coding compression data is recorded, it can search easily searching a recording block in order of record for recording block search of the request at the time of fast forward mode from the present reproduction recording block.

[0016]However, in the case of the review mode which returns from the present reproduction recording block to a reproduced recording block already. A desired recording block is searched from the top position of the recording block which shows the recording order currently recorded on management data, and after the recording block is discovered, it will return to a desired recording block.

[0017]For this reason, digital coding compression data was abundant, and especially in the case where a lot of recording blocks are being used, in order to search a desired recording block with a review mode, SUBJECT which requires much time occurred.

[0018]

[Problem(s) to be Solved by the Invention]The information which advances to a time series is changed into digital coding compression data with the conventional digital data recording and reproducing device, When it recorded on the nonvolatile memory card and special reproduction modes, such as a rapid traverse and a review, were chosen in this recorded digital coding compression data at the time of reproduction, the recording block position of desired data needed to be searched from the management data currently recorded on said nonvolatile memory card. For this reason, it is necessary to search the data in which the order of a recording block of the management data currently recorded on said nonvolatile memory

card is shown from the top of a recording block, and to find a desired recording block especially, in the case of review reproduction mode. Especially when inputting review reproduction mode and reproducing number recording block \*\*\*\*\* data, while reproducing the latter half of the data which uses a lot of recording blocks, in order to search from the recording block of the top of the order of record, SUBJECT which requires much time occurred.

[0019]An object of this invention is to provide the digital data playback equipment which searches the recording block on which desired data was recorded for a short time, and is made refreshable, when the selection input of the special reproduction modes, such as a rapid traverse under reproduction and a review, is carried out using the digital data recorded on the nonvolatile memory card.

[0020]

[Means for Solving the Problem]Analog information which advances to a time series from which this invention was changed into digital coding compression data, Said said recorded management data and said digital coding compression data are read from a nonvolatile memory card in which both management data including area information which records said digital coding compression data was recorded, In digital data playback equipment reproduced as analog information which carries out decoding extension of the read digital coding compression data, and advances to a time series, A reproduction control means with a microprocessor means in which said digital coding compression data currently recorded on said nonvolatile memory card and management data carry out reading control, A recording area extraction means to read management data of said nonvolatile memory card, and to extract recording area information, A list making means which creates the direction recording area list of reproduction orders based on recording area information extracted by said recording area extraction means, A memory measure which stores temporarily the direction recording area list of reproduction orders created by said list making means, Provide an input means which sets up operational mode of said playback equipment including special reproduction which reproduces digital coding compression data recorded on said nonvolatile memory card at an early speed compared with the time of record, and said reproduction control means, When special reproduction mode is set up by said input means, based on the direction recording area list of reproduction orders memorized by said memory measure, It is digital data playback equipment reading desired digital coding compression data and reproducing from recording area of said nonvolatile memory card.

[0021]Analog information which advances to a time series from which this invention was changed into digital coding compression data, Said said recorded management data and said digital coding compression data are read from a nonvolatile memory card in which both management data including area information which records said digital coding compression data was recorded, In digital data playback equipment reproduced as analog information which

carries out decoding extension of the read digital coding compression data, and advances to a time series, A reproduction control means with a microprocessor means which controls read-out of said digital coding compression data and management data which are recorded on said nonvolatile memory card, A recording area information extraction means which reads management data of said nonvolatile memory card, and extracts recording area information, A list making means which creates a reproduction bidirectional recording area list based on recording area information extracted by said recording area information extraction means, A memory measure which stores temporarily a reproduction bidirectional recording area list created by said list making means, An input means which sets up operational mode of said playback equipment is provided including special reproduction mode which reproduces digital coding compression data recorded on said nonvolatile memory card at an early speed compared with the time of record, When special reproduction mode is set up by said input means, said reproduction control means, It is digital data playback equipment reading desired digital coding compression data and reproducing from recording area of said nonvolatile memory card based on a reproduction bidirectional recording area list memorized by said memory measure.

[0022]Said reproduction control means of digital data playback equipment of this invention, When an input which sets up said special reproduction mode by said input means is made, measure input time for setting up the special reproduction mode, and when it is below predetermined time, Make the reproduction skip for every unit recording area of said recording area, and in more than predetermined time, It is made to skip for two or more recording area of every of said recording area, and is characterized by being what is controlled to read digital coding compression data currently recorded on said nonvolatile memory card, respectively.

[0023]

[Embodiment of the Invention]Hereafter, with reference to drawings, an embodiment of the invention is described in detail. Drawing 1 is a block diagram showing the 1 embodiment of the digital data recording and reproducing device concerning this invention. In addition. Drawing 5 and identical parts attach identical codes, and detailed explanation is omitted.

[0024]The difference with this drawing 1 and drawing 5 to the microprocessor 24 which controls delivery of the data between said speech processing IC31 and said nonvolatile memory card 25. It is in having formed a list generation processing means to generate the forward direction list or bidirectional recording list of recording area mentioned later, and having connected RAM11. This RAM11 is a basis of control of said microprocessor 24, and carries out edit memory of the management data read in said nonvolatile memory card 25.

[0025]The list generation processing means of said microprocessor 24 is explained using drawing 2.

[0026]Drawing 2 (a) is an explanatory view showing the directory entry of the MS-DOS format

form of the nonvolatile memory card 25, It comprises 32 bytes, a file name, a FAT entry, a file size and an extension, a file attribute, system reserve, time, a date, etc. are comprised, and, in addition to this, it is shown in the figure as information except the file name, the FAT entry, and the file size. It is assumed that the data of file name Chapter01 is started from a FAT entry [ 0002h ] cluster by this directory entry, and 64 K bytes of file size is recorded on it, for example.

[0027]As for the data of file name Chapter01, from this directory entry, it is shown that the cluster number 2 to data is recorded from a FAT entry, and 64 K bytes of data is recorded. 64 K bytes of data of this file size -- the storage capacity of 8 K bytes per one cluster -- having (in the case of 8 M bytes of nonvolatile memory card) -- when it carries out, division recording will be carried out to eight clusters. When FAT of this file is developed, as shown in drawing 2 (b), the cluster number 2 to the cluster number 2 of top cluster \*\* of data recording \*\*\*\*\*, and this top cluster. As the fat data in which the following record cluster is shown is indicated and it is shown in a figure, It is indicated to the fat data 3 at the top cluster 2, and is indicated like in the fat data 100 etc. to the cluster 3 at the fat data 4 and the cluster 4, This file data is completed to the cluster 6, and the numerals of FFFh are indicated to it as fat data in which a cluster is shown, and data can distinguish what is recorded in order of the cluster 2->3->4->100->101->102->5->6 from this FAT.

[0028]When reproducing the digital coding compression data of a desired file name by the usual reproduction mode with said digital data recording and reproducing device 20, By the basis of the directory entry of a designated file name, and a FAT entry, the cluster of said nonvolatile memory card 25 is controlled directly by said microprocessor 24, and data was read and it is reproducing. For this reason, like the conventional example mentioned above, at the time of special reproduction mode, said microprocessor 24 went to read again FAT currently recorded on the nonvolatile memory card 25, and was searching the rapid-traverse position and the review position.

[0029]Then, if reproduction mode is inputted with said operation switch 29 and the file name of desired digital coding compression data is specified, In advance of reading of the data of a designated file name, by the basis of control of the list generation processing means of said microprocessor 24. The direction list of reproduction orders to a cluster is created from the top cluster on which data was recorded, and it is made to store temporarily said RAM11, as said directory entry and FAT of the designated file name currently recorded on said un-volatilizing name memory card 25 are read and it is shown in drawing 2 (c). By the basis of the direction list of reproduction orders memorized by this RAM11, said microprocessor 24, After reading desired data in said nonvolatile memory card 25, and carrying out decoding extension in said decoding extension circuit 26 at a digital signal and changing into an analog signal in said D/A circuit 27, it amplifies in the voice response circuit 28, and is outputted as a sound from a

loudspeaker.

[0030]Thus, generate by said microprocessor 24, and based on the direction list of reproduction orders stored temporarily said RAM11, a rapid traverse of special reproduction mode is chosen and the cluster under present reproduction is made into the cluster number 3, for example, When rapid-traverse operation is inputted into the cluster of 2 beyond, said microprocessor 24, 2 beyond of the cluster number 3 detects from the direction list of reproduction orders memorized by said RAM11 cluster number 100, and it reads to the data currently recorded on the cluster number 100 of said nonvolatile memory card 25, it skips, and the reproducing output of the data of the cluster number 100 can be carried out.

[0031]When operation in which the selection input of the review mode is carried out, it makes the cluster under present reproduction the cluster number 100, and returns to the cluster in front of one is inputted, said microprocessor 24, It searches to a forward direction from the top cluster number 2 of the direction list of reproduction orders memorized by said RAM11, The cluster number 4 the fat data 100 is indicated to be is searched, and it reads to the data currently recorded on the cluster number 4 of said nonvolatile memory card 25, it skips, and the reproducing output of the data of the cluster number 4 can be carried out.

[0032]Since said digital data recording and reproducing device 20 is generated in size portable by a small light weight, a dry cell is used for operation power. For this reason, if power-saving of operation power is required and what has few power consumption is used for said microprocessor 24, even if a process speed will become slow and it will use the above-mentioned direction list of reproduction orders, It will take time, in order to search a desired cluster number especially at the time of review reproduction mode.

[0033]Then, generate both reproduction direction list, and it is made to store temporarily said RAM11, and enables it to search the cluster number of the skip place in a rapid traverse or review reproduction mode with the basis of this reproduction bidirectional list, as shown in drawing 2 (d).

[0034]This reproduction bidirectional list the top cluster of said direction of reproduction orders to the fat data of a reproduction opposite direction and a cluster. The end cluster of said direction of reproduction orders is transposed to the fat data of the top cluster of a reproduction opposite direction, and the cluster in the middle of a top cluster and an end cluster is transposed to the fat data of the cluster in front of the order of record of a self-cluster, and is created.

[0035]By this in the case of the fast forward mode of special reproduction mode. The cluster number of a rapid-traverse skip place is searched with the basis of the direction list of reproduction orders, and the special reproduction of the both sides of a request in a short time becomes possible by searching the cluster number of a review skip place with the basis of a reproduction opposite direction list in the case of a review mode.

[0036]Next, operation of the microprocessor 24 of creation processing of said reproduction both list is explained to be a flow chart of drawing 3 using the bidirectional list creation explanatory view of drawing 4.

[0037]When said digital data recording and reproducing device 20 is equipped with said nonvolatile memory card step 25 on which digital coding compression data was recorded and reproduction mode is inputted into it from the operation switch 29, at Step S1. The data of the directory entry of the designated file of said nonvolatile memory card 25 and a FAT entry is read, and it loads to said RAM11. Next, the cluster number indicated for the FAT entry of the directory entry is read at Step S2, it is set as the top cluster number of a forward direction list, and said top cluster number is set as the end cluster number of an opposite direction list at Step S3. Next, the fat data of the top cluster number of said forward direction is read by step S4. In Step S5, the fat data read by said step S4 shows an end cluster, and the numerals FFFh distinguish. Namely, as shown in drawing 4 (a), the cluster number 2 is made into the top cluster number of a forward direction list, And the numerals FFFh which show the end cluster of an opposite direction list are set up, and the fat data of the top cluster number of FAT indicated to said nonvolatile memory card 2 distinguishes further whether they are the numerals FFFh which show the end of data. If judged with their being the end-of-data numerals FFFh as a result of distinction of the fat data of said step S5, since only one cluster is used, and it is an unnecessary file of special reproduction, the return of the file will be carried out at Step S6.

[0038]When judged with it not being the ending signal FFFh, at said step S5 at Step S7. The cluster number 3 equivalent to the fat data 3 of the top cluster number 2 is saved as an end cluster of a forward direction list, and the cluster number 3 is saved as a top cluster of the opposite direction list which is equivalent to the fat data 3 of the cluster number 2 at Step S8. Next, the fat data 3 of the top cluster number 2 of the forward direction list distinguished at said step 5 is saved by step S9, and the data of FFFh in which a cluster is shown as fat data of the opposite direction list of cluster numbers 2 at Step S10 is saved. As a result, in a forward direction list, the fat data whose cluster number 2 of the following cluster is the cluster number 3 in a top cluster is saved, and FFFh is saved for the cluster number 2 as fat data by an opposite direction list at an end cluster.

[0039]Next, it transposes to the cluster number 3 of the fat data 3 of the cluster 2 saved by S10 from said step 7 at Step S11, As it returns to said step 5, the cluster number 3 is read from the FAT data loaded to said RAM11 and it is shown in drawing 4 (b), at Step S5. It is judged by the fat data 4 of the cluster number 3 in FFFh, and at Step S7. The cluster number 4 of the fat data 4 of the cluster number 3 is saved as an end cluster of a forward direction list, and the cluster number 4 of the fat data 4 of the cluster number 3 is saved as a top cluster of an opposite direction list at Step S8.

[0040]Next, the fat data 4 of the cluster number 3 of the forward direction list distinguished at said step 5 is saved by step S9, and 2 is saved as fat data of the opposite direction list of cluster numbers 3 at Step S10. As a result, the fat data which is the cluster number 4 of the following cluster is saved to the forward direction list of cluster numbers 3, and the fat data which is the following cluster number 2 is saved to an opposite direction list. After this step S10 is completed, it transposes to the cluster number of the fat data 4 of the cluster number 3 at Step S11, It returns to said step S5 again, the fat data of the cluster number 4 loaded to said RAM11 is read, Steps S5-S11 are processed, as shown in drawing 4 (c-h), the bidirectional list which consists of a forward direction and an opposite direction is created, and it is made to store temporarily said RAM11.

[0041]In the case of the above-mentioned special reproduction mode, by this. By the basis of the bidirectional list memorized by said RAM11, at the time of fast forwarding reproduction. The cluster number of a skip place is searched according to a forward direction list, at the time of review reproduction, the cluster number of a skip place is searched according to an opposite direction list, and the record data of the cluster of a skip place becomes refreshable in an instant.

[0042]In the special reproduction mode performed using said bidirectional list, it is provided in said operation switch 29. It is also possible to change the number of skips of said cluster by the time when the time which is pushing the rapid-traverse mode switch which is not illustrated and the review mode switch is read by said microprocessor 24 at, and the switch is pushed. When a nonvolatile memory card is 8 M bytes, the voice data per one cluster can be recorded for about 8 seconds. When pushed the short time for less than 2 seconds, said special reproduction mode switch, for example, When one beyond or the cluster which returned is reproduced from the cluster under present reproduction and it is pushed 2 seconds or more, By being made to perform 4 beyond or the cluster which returned to reproduction from the cluster under present reproduction, every [ 1 ], the rapid traverse which carried out 4 \*\* skip, or review reproduction is also possible, and search of the cluster on which desired voice data was recorded can be performed for a short time.

[0043]As mentioned above, the directory entry and FAT entry by which this invention is recorded on the nonvolatile memory card as having explained are once loaded to RAM by the basis of control of a microprocessor, The directory entry and FAT entry which were loaded to this RAM are used, Newly create a forward direction regenerated list, make it record on said RAM primarily, and this forward direction list is used, Search the cluster number of the skip place at the time of special reproduction, and based on the searched cluster number, A bidirectional list is created from the directory entry which read the data of the cluster number of a nonvolatile memory card, and was reproduced, or was loaded to said RAM, and FAT, When the cluster number of the skip place at the time of special reproduction was searched with the

basis of this bidirectional list, even if it used the processor with little power consumption with a slow process speed of the microprocessor which performs data processing, search of a desired skip place cluster was attained for a short time. Search of the cluster of a request in a short time was attained by setting up the cluster number to skip by the time of the special reproduction mode switch of the operation switch of said digital data recording and reproducing device to push.

[0044]Although explanation of the embodiment of said this invention explained using the device which has a record reproduction function of digital data, it is clear that the data in which the nonvolatile memory card was recorded is applicable to the special reproduction mode in the reproduced digital data reproduction dedicated device.

[0045]Read from said nonvolatile memory card, and read the data of a directory entry or a FAT entry by a microprocessor, and it is once memorized, And although RAM which memorizes the list was explained using the example by which external connection is carried out to said microprocessor, it is [ after creating the direction of reproduction orders, or a bidirectional list ] clear that its it is also possible to use RAM built in said microprocessor.

[0046]

[Effect of the Invention]This invention loads the directory entry of file data and the data of FAT area by which nonvolatile memory card record is carried out, Create a forward direction list or a \*\*\*\*\* strike from this data, memorize to RAM, and by the forward direction of this RAM, or the basis of a bidirectional list. By performing reading control of the file data from the cluster of said nonvolatile memory card, By attaining search of the cluster of the skip place of special reproduction mode for a short time, and using a bidirectional list further, The process speed of the microprocessor which controls delivery of the data of a nonvolatile memory card and speech processing IC becomes possible [ using a late processor with little power consumption ], and it has the effect that a cheap digital data recording and reproducing device can be provided by lightweight small size.

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[Translation done.]